Mechanical and durability properties of recycled aggregate concrete with ternary binder system and optimized mix proportion

Autores

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Abstract

This study aimed to investigate the mechanical and durability properties of recycled aggregate concrete with a ternary binder system and optimized mix proportion. Two concrete batches were developed using a densified mix design approach (DMDA) to evaluate the required mix proportions. Batch I have GGBS content varied at 0%, 10%, 20%, 30%, 40% and 50% at constant w/b ratio of 0.45, while batch II concrete mix have varied water/binder ratios: 0.3, 0.35, 0.4, 0.45 and 0.5 at constant GGBS replacement level of 30%. The fine aggregate (river sand) of the two batches was blended with fly ash at optimum loose packing density (FA + Sand) and superplasticizer (SP) was incorporated in the mix at a constant level of 1.4%. A control mix comprising of natural aggregate was also developed. The results obtained showcased the feasibility of producing structural concrete with recycled aggregates using GGBS and fly ash. The mechanical and durability properties were best at 30% GGBS content and 0.35 water/binder ratio. The DMDA for mix proportion adopted for RAC contributed significantly to improving its properties when compared to NAC, especially at the optimum observed RAC mix with compressive strength of 52 MPa. Also, the mix demonstrated good permeability resistance in terms of chloride-ion ingress and capillary water absorption.

Palabras clave

Recycled aggregate concrete, Densified mix design, Ternary binder, Durability, Mechanical properties